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CLAIMS

1. A composition for reducing the concentration of molecular oxygen present in an atmosphere or liquid, comprising at least one reducible organic compound which  
5 is reduced under predetermined conditions, the reduced form of the compound being oxidizable by molecular oxygen, wherein the reduction and/or subsequent oxidation of the organic compound occurs independent of the presence of a transition metal catalyst.
- 10 2. A composition according to claim 1, wherein the reduction and/or subsequent oxidation of the at least one reducible organic compound is also independent of the presence of an alkali or acid catalyst.
3. A composition according to claim 1 or 2, wherein the  
15 predetermined conditions are selected from the group consisting of irradiation with light of a certain intensity or wavelength, gamma-irradiation, corona discharge, exposure to an electron beam, or application of heat.
- 20 4. A composition according to claim 3, wherein the predetermined conditions is irradiation with visible or ultraviolet light.
5. A composition according to claim 3, wherein the predetermined conditions is gamma-irradiation.
- 25 6. A composition according to claim 3, wherein the predetermined conditions is exposure to an electron beam.
7. A composition according to any one of claims 4, 5 and 6, wherein the reducible organic compound is reduced by conversion to an excited triplet form.
- 30 8. A composition according to any one of claims 4-7 wherein the reducible organic compound is selected from the group consisting of quinones, photoreducible dyes and carbonyl compounds which have absorbance in the UV spectrum.
- 35 9. A composition according to claim 8, wherein the

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reducible organic compound is selected from the group consisting of benzoquinone, 9,10-anthraquinone, substituted 9,10-anthraquinone, 1,4-napthoquinone, azo thiazine, indigoid and triarylmethane compounds.

- 5 10. A composition according to claim 9, wherein the reducible organic compound is selected from the group consisting of 2-ethyl-9,10-anthraquinone, 2-methyl-9,10-anthraquinone and anthraquinone-2-aldehyde.
11. A composition according to any one of claims 1-7,
- 10 wherein the reducible organic compound is present in a polymerised or oligomerised form.
12. A composition according to claim 11, wherein the polymerised organic compound comprises monomers or co-monomers which are covalently bonded to the reducible
- 15 organic compound.
13. A composition according to claim 12, wherein the reducible organic compound is selected from the group consisting of quinones, photoreducible dyes and carbonyl compounds which have absorbance in the UV spectrum.
- 20 14. A composition according to claim 13, wherein the reducible organic compound is selected from the group consisting of benzoquinone, 9,10-anthraquinone, substituted 9,10-anthraquinone, 1,4-napthoquinone, azo thiazine, indigoid and triarylmethane compounds.
- 25 15. A composition according to claim 14, wherein the reducible organic compound is selected from the group consisting of 2-ethyl-9,10-anthraquinone, 2-methyl-9,10-anthraquinone and anthraquinone-2-aldehyde.
16. A composition according to any one of the preceding
- 30 claims, wherein the reducible organic compound comprises 0.1-99.9wt% of the composition.
17. A composition according to claim 16, wherein the reducible organic compound comprises 0.1 - 50 wt% of the composition.
- 35 18. A composition according to any one of the preceding

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claims, further comprising a scavenging component reactive towards an activated oxygen species.

19. A composition according to claim 18 wherein the scavenging component is a compound selected from the group consisting of organic antioxidants, organic phosphites, organic phosphines, organic phosphates, hydroquinone and substituted hydroquinone; inorganic compounds including sulphates, sulphites, phosphites and nitrites of metals; sulphur-containing compounds including thiodipropionic acid and its esters and salts, thio-bis (ethylene glycol beta-aminocrotonate), cysteine, cystine and methionine; and nitrogen-containing compounds including primary, secondary and tertiary amines and their derivatives.

20. A composition according to claim 19, wherein the scavenging compound is selected from the group consisting of triphenylphosphine, triethylphosphite, triisopropylphosphite, triphenylphosphite, tris (nonylphenyl) phosphite, tris (mono- and bis-nonylphenyl) phosphite, butylated hydroxytoluene, butylated hydroxyanisole, tris (2, 4-di-tert-butylphenyl) phosphite, dilaurylthiodipropionate, 2,2'-methylene-bis-(6-t-butyl-p-cresol), tetrakis (2, 4-d-tert-butylphenyl) (4, 4'-biphenylene diphosphonite, poly (4-vinylpyridine) and mixtures thereof.

21. A composition according to claim 18, wherein the scavenging component is present in a polymerised or oligomerised form.

22. A composition according to claim 21 wherein the scavenging component comprises monomers or co-monomers which are covalently bonded to a compound reactive towards an activated oxygen species.

23. A composition according to claim 22 wherein the compound reactive towards an activated oxygen species is selected from the group consisting of organic antioxidants, organic phosphites, organic phosphines,

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- organic phosphates, hydroquinone and substituted hydroquinone; inorganic compounds including sulphates, sulphites, phosphites and nitrites of metals; sulphur-containing compounds including thiodipropionic
- 5 acid and its esters and salts, thio-bis (ethylene glycol beta-aminocrotonate), cysteine, cystine and methionine; and nitrogen-containing compounds including primary, secondary and tertiary amines and their derivatives.
24. A composition according to claim 23 wherein the
- 10 compound reactive towards an activated oxygen species is selected from the group consisting of triphenylphosphine, triethylphosphite, triisopropylphosphite, triphenylphosphite, tris (nonylphenyl) phosphite, tris (mono- and bis-nonylphenyl) phosphite,
- 15 dilaurylthiodipropionate, 2,2'-methylene-bis-(6-t-butyl-p-cresol), butylated hydroxytoluene, butylated hydroxyanisole, tris (2, 4-di-tert-butylphenyl) phosphite, tetrakis (2, 4-d-tert-butylphenyl) (4, 4'-biphenylene
- 20 diphosphonite, poly (4-vinylpyridine) and mixtures thereof.
25. A composition according to any one of the preceding claims, further comprising an adhesive agent or a polymer.
26. A composition according to claim 25, wherein the polymer is selected from the group consisting of
- 25 polyvinyls, polyurethanes, polyolefins and polyesters or their copolymers, ethyl cellulose, cellulose acetate, silica gel or mixtures thereof.
27. A composition according to any one of claims 11-17, 21-26, wherein the reducible organic compound and the
- 30 scavenging component are present in polymerised form(s).
28. A method for reducing the concentration of molecular oxygen present in an atmosphere or liquid, comprising exposing the atmosphere or liquid to a composition according to any one of claims 1-27 and thereafter,
- 35 reducing the reducible organic compound.

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29. A method for reducing the concentration of molecular oxygen in an atmosphere or liquid, comprising exposing the atmosphere or liquid to a pre-reduced form of a composition according to any one of claims 1-27.
- 5 30. A polymeric film comprising at least one layer comprising a composition according to any one of claims 1-27.
31. A multilayer polymeric film comprising at least one layer comprising a composition according to any one of
- 10 claims 1-17, 25 and 26, and at least one other layer comprising a scavenging component reactive towards an activated oxygen species.
32. A packaging material comprising a composition according to any one of claims 1-27 or a film according to
- 15 claim 30 or 31.
33. An indicator of breakage of a package seal, comprising a composition according to any one of claims 1-27, wherein the reducible organic compound undergoes a detectable change in colour, fluorescence emission or
- 20 UV-visible, infrared, near-infrared absorption spectrum as its capacity for oxygen scavenging becomes exhausted due to breakage of the seal.
34. An indicator according to claim 33, wherein the reducible organic compound undergoes a detectable change
- 25 in fluorescence emission.